



KERR-McGEE CHEMICAL LLC



FINAL REPORT

for the

LINDSAY LIGHT II SITE CHICAGO, ILLINOIS

**Prepared by
Bono Consulting
Kerr-McGee Chemical LLC**

**Document Control
Number 2
January 7, 2000**



KERR-McGEE

KERR-McGEE CENTER • P.O. BOX 25861 • OKLAHOMA CITY, OKLAHOMA 73125

January 10, 1999
LKE-053

HAND DELIVERED

TO: Mr. Fred A. Micke
On-Scene Coordinator
Illinois/Indiana Remedial Response Branch
U.S. EPA, Region 5
77 W. Jackson Blvd. (SE-5J)
Chicago, Illinois 60604-3590

SUBJECT: Lindsay Light II Site Final Report

REFERENCE: Docket No. V-W-96-C-353

Dear Mr. Micke:

In accordance with your request of November 11, 1999, please find enclosed Kerr-McGee Chemical LLC's Final Report, as required by Section V, paragraph 3.5 of the Unilateral Administrative Order.

If you have any questions, please call me at your convenience.

Sincerely,
KERR-McGEE CHEMICAL LLC

J. D. White
Offsites Project Manager

cc: (cover letter and report without attachments)
Mary Fulghum, Esq.
Asst. Regional Counsel
U. S. Environmental Protection Agency
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77 West Jackson Blvd.
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LINDSAY LIGHT II SITE

FINAL REPORT

Revision Number: 0

Approved By:

Date: January 7, 2000

Replaces: New

AFFIDAVIT

Under penalty of law, I certify that, to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of this report, the information submitted is true, accurate, and complete.


Signature

J.D. White

Senior Project Manager
Kerr-McGee Corporation
Name and Title

Jan. 10, 2000

Date

LINDSAY LIGHT II

FINAL REPORT

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1.0 INTRODUCTION / SUMMARY OF EVENTS

This Final Report has been prepared to comply with Paragraph 3.5 of the Unilateral Administrative Order (UAO) for the Lindsay Light II Site (Site) issued by the United States Environmental Protection Agency (U.S. EPA). This report also meets the requirements of Section 01030, Paragraph 3.4 of Document 300 of the Scoping and Planning Documents prepared for the Project. The UAO was issued to the Chicago Dock & Canal Trust (Chicago Dock) and the Kerr-McGee Chemical Corporation (Kerr-McGee Chemical) on June 6, 1996. This Final Report generally conforms to the requirements set forth in Section 300.165 of the NCP.

There were two primary phases of the remedial action at the site. The first phase began in 1996 and stopped in 1997. 24,019 tons of material exceeding the cleanup criterion were excavated from a parking lot and shipped to a United States Nuclear Regulatory Commission (U.S. NRC) licensed disposal site during Phase 1, which included the removal of radioactive contamination to the depth of the water table. The second phase was initiated and completed in 1999, and this Phase encompassed the removal of all remaining radioactive contamination, above and below the water table within the borders of the parking lot. 4,809 additional tons of material exceeding the cleanup criterion were excavated and shipped to a U.S. NRC licensed disposal site during Phase 2, for a project total of 28,828 tons removed and shipped.

River East LLC (River East) is the successor in interest to Chicago Dock. Kerr-McGee Chemical LLC (Kerr-McGee) is the successor in interest to Kerr-McGee Chemical. These corporate name-changes occurred during the hiatus between Phase 1 and Phase 2. When making reference to a corporate entity, this report refers to that entity by the legal name that was in place at the time of the activity discussed.

The Final Report is similarly broken into two phases. Kerr-McGee has prepared the general report, which includes a detailed description of 1996-1997 Phase 1 activities, as well as a brief summary of the 1999 Phase 2 activities. The firm of STS Consultants Ltd. (STS), representing River East has prepared a detailed description of Phase 2 activities. The Phase 2 report will be submitted to the U.S. EPA by STS under separate cover.

1.1 Site Location and Description

The Site is located at 316 E. Illinois Street in downtown Chicago, Illinois. The Site extends from Illinois Street on the south to Grand Avenue on the north. The Site is bounded by Columbus Drive on the west and McClurg Court on the east. Figure 1-1 is a Site Location Map indicating the location of the property within the City of Chicago. The dimensions of the Site are 66 meters north to south and 186 meters east to west, making the Site approximately 12,276 square meters.

The immediately adjacent property owner, on all four sides of the Site, is the City of Chicago. This is because the Site is a full city block, bounded by public streets on all sides.

At the time of the initial remediation in 1996, the Site was undeveloped, except for sidewalks, and was being used as a commercial parking lot. The parking lot was paved with asphalt and had guard rails and landscaping bordering it. The Site is situated in an urban area and is surrounded by commercial and residential buildings. The Ogden Slip is located 1/10th mile southeast of the Site, the Chicago River is located 1/4 mile south of the Site, and Lake Michigan is about 1/4 mile east of the Site.

1.2 Site History

Chicago Dock was founded in 1857 as The Chicago Dock & Canal Company, and their corporate successor River East is the current owner of the Site. Chicago Dock records indicate that a portion of the property fronting Illinois Street at 316 to 322 East was leased to the Lindsay Light Company (Lindsay Light) from about 1915 to 1932, when the operation was moved to West Chicago, Illinois.

Processing of thorium bearing monazite sand reportedly took place at the 316 E. Illinois St. facility. The E. Illinois St. building was demolished around 1933.

Up until May 1999, the Site was most recently used as a daily-rate parking lot. In June of 1999, River East began construction of the River East Center. Upon completion, this proposed development will consist of a 620-unit apartment tower, and a 456-room Embassy Suites hotel joined by a parking garage and retail center.

1.3 Contaminants of Concern

Thorium occurs in nature as the parent radionuclide Thorium-232 in association with its progeny in a decay sequence known as the Thorium Decay Series. A principal ingredient in gas mantle manufacturing is thorium as a nitrate. Small amounts of cerium, beryllium, and magnesium nitrates are also used. Thorium was extracted from the monazite sand using an acid leach. The gas mantles were then dipped into a solution containing the thorium nitrate to provide the mantle's incandescence strength.

The Site was also known to have some quantity of petroleum contaminated soils, possibly from underground storage tanks from other historical activities at the Site not associated with Lindsay Light or gas mantle production. Petroleum contaminated soils are not addressed in the UAO and are therefore only minimally addressed in this Final Report.

1.4 Local Background and Cleanup Criterion

The UAO for the Site stated that contamination should be removed until a cleanup criterion of 5 picoCuries per gram total radium (radium-226 + radium-228) over background was achieved. To determine the criterion, the local background for radium-226 and radium-228 at the Site was determined by averaging the values

from four soil samples on the property and eight soil samples off-site but in the immediate vicinity of the Site.

The background soil samples were collected on September 9th and 10th, 1996. The average value for total radium of the twelve background samples was 2.1 picoCuries per gram, thereby establishing the cleanup criterion for the Site at 7.1 picoCuries per gram.

1.5 Chronological Narrative

Chicago Dock entered an Administrative Order of Consent (AOC) with U.S. EPA on January 27, 1994. In response to this AOC, an initial investigation of the Site was conducted by STS, on behalf of Chicago Dock. This investigation identified 12 areas exhibiting elevated gamma radiation which were reported in the Report for Characterization Investigation Gamma Radiation Survey dated October 27, 1995. Calculated exposure rates at the time of the investigation did not represent an additional radiological risk to lot attendants or lot patrons in excess of the background conditions already present in downtown Chicago.

*Double-check
Conclusion?*

The U.S. EPA issued the UAO for the removal activities at the Site on June 6, 1996. In response to the UAO, Kerr-McGee Chemical prepared and issued the Scoping and Planning Documents for Excavation and Restoration Activities at the Lindsay Light II Site Chicago, Illinois (S & P Documents). The *S & P Documents* were originally issued on July 25, 1996, and then were revised to incorporate U.S. EPA's comments on October 23, 1996.

Also in response to the UAO, Kerr-McGee Chemical retained STS to perform a Delineation Drilling program at the Site. The data collected during this drilling program was submitted to the U.S. EPA. Delineation Drilling Investigation Report (No. 1) was submitted to the U.S. EPA on October 11, 1996, and Delineation Drilling Investigation Report (No. 2) was submitted to the U.S. EPA on January 16, 1997. Because these two delineation drilling reports and the *S & P Documents* have already been submitted to the U.S. EPA, they are not included with the other attachments of this report.

*Yes
from Delineation
Drilling Report*

Work Orders for Property Excavation and Restoration for both the property owned by Chicago Dock and by the City of Chicago were submitted to the U.S. EPA on October 17, 1996. These Work Orders are included as Attachment A. Attachment A also contains Drawing LL II – WO that shows the estimated proposed limits of excavation based on the results of the delineation drilling investigations.

Phase 1 excavation began on October 25, 1996 and continued through June 18, 1997.

Phase 1 restoration began as soon as excavated areas were released by U.S. EPA representatives. After a big push to finish before the annual July 3 fireworks display in Chicago, the parking lot was reopened on July 2, 1997. The Site was

then again used as a parking lot until May 16, 1999 when it was closed to begin construction of the River East Center.

In anticipation of resuming excavation in conjunction with the construction of the River East Center, STS, on behalf of River East, prepared a Work Order for the Phase 2 activities. This Work Order was submitted to the U.S. EPA on July 8, 1999. Because the Phase 2 Work Order has already been submitted to the U.S. EPA, it is not included with the other attachments of Phase 2 Final Report.

Phase 2 excavation of materials with radioactivity exceeding the cleanup criterion began under STS's direction on June 1, 1999 and was completed on October 22, 1999. Construction of the River East Center is currently under way. Because excavation below the radiologically verified areas is required for the proposed below-grade parking garage, no restoration (backfilling) was performed for the Phase 2 work.

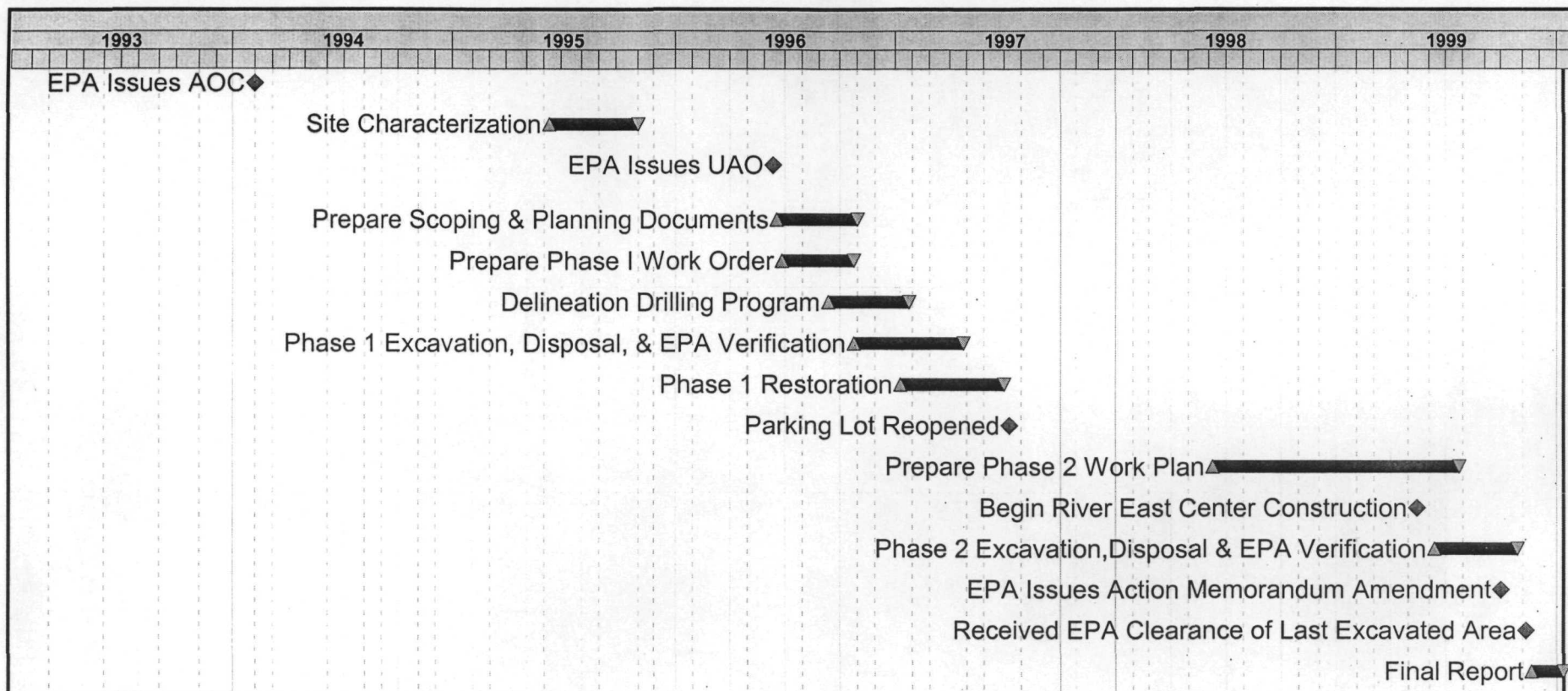
The U.S. EPA issued the Action Memorandum Amendment on September 22, 1999. This Amendment documents that institutional controls are adequate to protect human health and the environment with respect to thorium present under the public rights-of-way adjacent to the Site.

A final project schedule showing the project timeline from the AOC through the release of the final area by the U.S. EPA has been included as Figure 1-2.

1.6 Good Faith Estimate of Total Cost Incurred

Kerr-McGee estimates that their total cost for complying with the UAO is approximately eleven million, six hundred thousand dollars (\$11,600,000). Copies of contracts, subcontracts and miscellaneous purchase orders are included in Attachment B, and copies of miscellaneous invoices associated with these agreements are included in Attachment C. River East also incurred a cost associated with their compliance with the UAO in the Phase 2 work, and that cost can be found in the STS Phase 2 Final Report.

Pursuant to CERCLA, Section 106(b)(2)(A)-(D), 42 U.S.C., Section 9606(b)(2)(A)-(D), Kerr-McGee, reserves the right to petition the U.S. EPA for reimbursement of the reasonable response costs incurred to comply with the U.S. EPA's UAO, Docket No. V-W-96-C-353, relating to the Site.



2.0 REMEDIAL ACTION DETAILS

The Phase 1 remediation consisted of excavating soil and debris materials with radioactivity greater than 7.1 pCi/g from the 12 areas identified 10/27/95 Site Characterization Survey, as well as from the areas identified in the 1996 delineation drilling program. Kerr-McGee Chemical was the General Contractor for the project. Their principal subcontractors were Sciencetech/Grant (craft labor and equipment), Fluor Daniel GTI (engineering), STS (delineation drilling), Yankee/CSI (health physics technicians), MTI (intermodal container transportation), and Vulcan (gravel supplier).

The Phase 2 remediation consisted of surveying excavated soil down to a depth of five feet from the remainder of the areas of the Site that had not been excavated in Phase 1. Phase 2 also consisted of excavation of known material exceeding the cleanup criterion located below the water table in an area known as Lake Lindsay.

The working relationships for the Phase 2 remediation were slightly more complex than those for Phase 1, due to the ongoing general construction of the River East Center. During Phase 2, River East was the General Contractor for excavation and Kerr-McGee was the General Contractor for shipping. River East's principal subcontractors were STS (environmental project management), RSSI (health physics technicians), Morse-Diesel (construction managers) and Budron (excavating). Kerr-McGee's principal subcontractors were Envirocon (laborers), Bono Consulting (engineering), Double M Trucking (intermodal container transportation), and Tekton (health physics technicians).

At the end of Phase 2, all of the areas on the Site with radioactivity above the cleanup criterion were remediated and released by the U.S. EPA. Radioactivity above the cleanup criterion under the public rights-of-way adjacent to the Site was approved to be left in place with institutional controls enacted by the 9/22/99 Action Memorandum Amendment issued by the U.S. EPA.

2.1 Phase 1

During Phase 1, clean overburden was separated from the contaminated material, surveyed and sampled, and later reused for backfill. Material with levels of radioactivity greater than 7.1 pCi/g was loaded directly into intermodal containers. The intermodal containers were then transported by truck to the railyard at Blue Island, IL, where they were placed on railcars for delivery and ultimate disposal at the U.S. NRC licensed Envirocare of Utah (Envirocare) disposal facility. 1,071 containers carrying 24,019 tons of radioactive material were shipped from the Site during Phase 1.

Except for one area where material with radioactivity exceeding the cleanup criterion was present below the water table (the area known as Lake Lindsay), all of the Phase 1 excavated areas were remediated to the cleanup criterion and released by the U.S. EPA.

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Phase 1 restoration consisted of backfilling the excavations with clean overburden and imported fill, and rebuilding the parking lot. Restoration also included site landscaping, perimeter sidewalks and guardrails, site lighting and drainage.

2.1.1 Quantities and Types of Materials Removed

During Phase 1, 24,019 tons of material with radioactivity exceeding the cleanup criterion were excavated, loaded into intermodal containers, and shipped by truck and rail to Envirocare. The material was comprised of soil and urban fill consisting of brick, cinders, wood, metal, and debris.

Clean overlying materials were surveyed by the health physics technicians and released as non-radioactive material. This included large concrete chunks, steel rails, railroad ties, and petroleum-contaminated soil. The concrete and steel rails were sent to recyclers. The railroad ties and petroleum-contaminated soil were turned over to Chicago Dock for disposal as special waste. Railroad tie and petroleum contaminated soil disposal were not a condition of the UAO, and therefore the quantity disposed is unknown and the manifests are not available.

2.1.2 Destinations of Disposed Materials

Material with radioactivity exceeding the cleanup criteria was sent via train to Envirocare of Utah, Inc., Clive Disposal Site. The address is Interstate 80, Exit 49, Clive Utah, 84029. Copies of Envirocare's Forms 540 and 541 reflecting shipment to and receipt of this material at the U.S. NRC licensed disposal site are included in Attachment D.

2.1.3 Verification Sampling

After the material above the cleanup criterion had been excavated in an area, Kerr-McGee Chemical's health physics technicians performed a verification survey in accordance with Kerr-McGee Standard Operating Procedure (SOP)-223. Copies of the procedures are contained in the *S & P Documents*.

If the verification survey passed the release criteria, then the excavation was divided into 100-square meter grids for sampling. The grids were then sampled in accordance with SOP 214 and the Field Sampling Plan (Document 201 of the *S & P Documents*). One composite sample was analyzed for each 100 square meters, or less, of excavated area. The composite was prepared from five samples, about 15 centimeters (6 inches) deep, obtained at the center (one sample) and half way between the center and each corner (four samples).

If the samples met the release criteria defined in the UAO, then form 223-1: *Notification of Successful Verification Survey* was completed and submitted to the U.S. EPA. After the U.S.EPA reviewed the data and

performed their own survey and sampling of the excavation, the U.S.EPA On-Scene Coordinator (OSC) signed off on form 223-1 and sent it back to Kerr-McGee Chemical. This served as the authorization to backfill.

Attachment E includes the U.S. EPA's authorizations that the UAO verification criteria were met for each of the excavated areas outside of Lake Lindsay. Attachment C also includes a summary of the sample results for each requested area, as well as a grid map detailing the specific area requested.

Phase 1 was divided into 12 areas identified in the 10/27/95 Site Characterization Survey. Furthermore, a metric grid pattern was established with an origin of 0 North and 0 East located in the southwest corner of the site. Figure 2.1 shows the areas remediated in Phase 1. The grid maps included in Attachment C are identified by a combination of area numbers and the metric coordinates. These grid locations are shown on Figure 2.1.

As shown on Figure 2.1, the limits of Lake Lindsay were not verified in Phase 1. The final release of Lake Lindsay is detailed in STS's Phase 2 Final Report.

2.1.4 Overburden Sampling

Overburden is a mining term that Kerr-McGee Chemical used to define clean soil that had to be moved to excavate underlying material exceeding the cleanup criterion. The excavated overburden was spread out in thin lifts and surveyed in accordance with SOP 223. Any areas exceeding the cleanup criterion were removed, and then the pile was resurveyed. If the entire pile surveyed clean, the pile was divided into grids and sampled in accordance with SOP 214.

If the material was then found to measure less than or equal to the cleanup criterion, it was suitable to be used as backfill as long as it was placed in an area where it would be no closer than two feet below the final surface. Twenty-six overburden piles (~1,200 cubic yards) were surveyed, sampled and reused as backfill. Results of the overburden sampling are included in Attachment F.

2.1.5 Air Monitoring

During Phase 1, four air monitoring stations were established in the center of all four perimeter boundaries. High-volume air sampling pumps were

hard-wired with electricity so no generators were required. The pumps were activated to collect air samples during all excavation activities.

Each month the data was reviewed by Kerr-McGee Chemical's contract Health Physics Supervisor and verified by Kerr-McGee Chemical. Monthly summaries of the perimeter air monitoring sampling results are included in Attachment G.

2.1.6 Permits

The remediation of this site was mandated by the U.S. EPA under CERCLA guidelines. Under CERCLA, Respondents are exempt from obtaining federal, state or local permits for on-site work, although on-site work must comply with the substantive requirements of such permits. Applicable permits and authorizations are required for off-site activities.

Copies of permits obtained for Phase 1 of this project are included in Attachment H. Permits were received for lane closures, sidewalk removals, driveway openings, hydrant water use, drainage reconstruction, parking meter and sign removal.

2.1.7 Underground Storage Tanks

Six underground storage tanks were located and removed during the Phase 1 excavation. Three of the tanks were steel and did not exhibit any evidence of a release. Their historical contents were unknown, but were most likely petroleum or heating oil storage. These three tanks were in Phase 1 excavation area so they were removed by Kerr-McGee Chemical under the observation of the Chicago Fire Department and the Chicago Department of the Environment. The tanks were cleaned, and surveyed by the health physics technicians and released as non-radioactive scrap metal.

Three very old (~1900) wooden casks were also encountered outside of limits of the Phase 1 radioactive material removal. The soil around these casks did exhibit some petroleum contamination. Chicago Dock notified the Illinois Environmental Protection Agency before proceeding with the removal. The casks and some quantity of petroleum contaminated soil were excavated and disposed by Chicago Dock under the observation of the Chicago Fire Department and the Chicago Department of the Environment. Petroleum contaminated soil and abandoned underground storage tanks were not a condition of the UAO and are only addressed in this report because of their environmental nature.

2.1.8 QA/QC Program

All activities performed for the Lindsay Light II Site were performed under the auspices of an internally managed quality assurance (QA) program. The purpose of the Quality Assurance Project Plan (QAPP) (Document 200 of the *S & P Documents*) was to provide an internal mechanism for Kerr-McGee Chemical to measure the progress and quality of their work.

The QAPP included in the *S & P Documents* presented the organization, objectives, functional activities and specific QA and quality control (QC) activities associated with the excavation and restoration activities at the Site.

All QA/QC procedures were in accordance with applicable professional technical standards, U.S. EPA requirements, government regulations and guidelines, and specific project goals and requirements. The QAPP was prepared by Kerr-McGee Chemical in accordance with U.S. EPA QAPP guidance documents, in particular, the Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAMS-005/80), and the Region V Model QAPP (1991).

Kerr-McGee Chemical developed their quality assurance program for the excavation and restoration activities at the Site. Consistent with Kerr-McGee Chemical policy, this program complied with the applicable parts of ANSI/ASQC Q9001-1994 (Quality Systems model for quality assurance in design/development, production, installation, and servicing).

The program provided positive management control and included procedures and requirements to establish a record of conformance. This quality assurance program together with approved work plans, established procedures, and work instructions provided the operational and administrative requirements for the excavation and restoration of this Site. Within this system, individual and organizational responsibilities were assigned for the activities and control measures necessary to achieve, verify, and document conformance.

Adherence to this program, approved procedures, and regulatory compliance requirements was mandatory for all Kerr-McGee Chemical employees and for all subcontractor organizations.

Imported backfill was tested in accordance with Specification 02200 of the *S & P Documents* for geotechnical, radiological and chemical properties. Radiological analysis was performed to ensure that imported fill had less than 3.7 pCi/g total radium, a limit set by U.S. EPA in Section 3.2 of Technical Memo Decision Rule Development and Application, dated March 15, 1995 for Project SAE65658.SA.DE. Chemical analysis was also performed to ensure that the material was not classified as a hazardous waste. Analyses included TCLP, pH, reactivity, and flashpoint. Results of the radiological and chemical analysis are included in Attachment I.

Geotechnical testing included classification/particle size analysis, specific gravity, moisture density, and Atterberg limits. Backfill compaction was tested using nuclear density gauges. Geotechnical testing is provided in Attachment J. Quality Control reports for the concrete placement are

included as Attachment K. (Note: All backfill and concrete placed as part of the Phase 1 restoration was removed in Phase2 for the construction of the River East Center.)

Internal QA documentation including Non-conformance Reports (NCRs), Serious Incident Reports (SIRs), and Corrective Action Reports (CARs) are included as Attachment L.

Fourteen NCRs, five SIRs, and one CAR were issued during the project. As shown in Table 2-1, monitoring the quality system enabled Kerr-McGee Chemical to document nonconformances and prepare a recommendation for disposition. The QA system then employs corrective and preventive action to correct and eliminate root causes of problems to attempt to prevent them from recurring. Table 2-1 summarizes the NCRs, SIRs, and CARs issued during Phase 1.

TABLE 2-1
QA/QC Report Summary

Incident #	Date	Description	Disposition
NCR-96-001	10/15/96	Incorrectly filled out Chain of Custody form.	Corrected form and resent.
NCR-96-002	10/21/96	Seven boreholes incorrectly laid out.	Purchased and started using metric tape.
NCR-96-003	10/24/96	Contractor employee onsite before training records submitted.	Employee removed from site & records submitted.
NCR-96-004	11/5/96	Changes to HP surveys not initialed.	HPs instructed to initial all changes.
SIR-96-005	11/11/96	HP tech struck by equipment.	Discussed importance of eye contact with equipment operators.
NCR-96-006	11/20/96	Container arrived on site with small quantity of soil from some other job.	Trucking firm to inspect empty containers prior to bringing to site.
SIR-96-007	11/20/96	Excavated through live electric line.	Scan areas with utility locator prior to digging.
SIR-96-008	11/23/96	Excavator damaged underground electric conduit.	Operator was retrained in proper excavation practices.

NCR-96-009	11/25/96	Excavated below design depths.	Operators were briefed regarding design depth prior to beginning new excavations.
NCR-96-010	12/12/96	Incorrect wording (replicate instead of duplicate) & unsigned sample-tracking form in verification data packages.	Inconsistencies addressed and corrections incorporated henceforth.
NCR-96-011	12/18/96	Perimeter air monitor ran out of gas and stopped.	HPs will check air monitors twice daily.
NCR-97-001	1/13/97	Trucking firm transported container with wrong BOL.	Drivers trained to confirm that BOL matches container.
SIR-97-002	1/18/97	Battery exploded while charging at high amperage to save time.	Discussed proper battery charging practices at safety meeting.
SIR-97-003	2/27/97	Laborer slipped on mud while lifting & strained back.	Discussed proper lifting techniques at safety meeting.
NCR-97-004	3/3/97	Employee lost dosimetry.	Employees issued chains for dosimetry.
NCR-97-005	3/10/97	Radioactive activity mismatched on BOLs 9530 & 9531.	Reissue and double check before signing.
NCR-97-006	3/19/97	Concrete exceeded slump requirements.	Check slump prior to pour.
NCR-97-007	4/8/97	Work Location sheets from 3/31/97 completed incorrectly.	Employees retrained.
NCR-97-008	6/6/97	Overdue submittals for backfilling, compaction and concrete.	Submittals provided.
CAR-97-001	1/13/97	3 containers opened in rail yard.	Emergency response to cleanup material, railroad instructed to not hump flat cars.

2.1.9 Parking Lot Restoration

To complete the site restoration, Kerr-McGee Chemical's restoration contractor backfilled the excavations, installed a new storm sewer system, paved the surface with asphalt, and re-stripped the parking lot. The engineering drawings for the Drainage Modifications and Parking Lot Restoration were prepared by Fluor Daniel GTI and have been included as Attachment M.

2.2 Phase 2

Phase 2 remediation was completed concurrently with the construction of the River East Center. This development included a 55-foot deep basement to be used for underground parking. The first step in performing this deep site-wide

excavation was for the River East Center contractor to install a perimeter slurry wall down to a depth of 62 feet. After the cutoff wall was installed, the Site could be dewatered and excavation of the area formerly known as Lake Lindsay could proceed below the natural water table.

During the excavation for the River East Center, the entire site within the slurry wall was excavated. The Phase 2 Work Order approved by the U.S. EPA required that excavated soil from areas not excavated in Phase 1 be surveyed for total radium in excess of the cleanup criterion down to a depth of five feet. This activity was performed from June 1, 1999 through July 20 1999, and 48 containers of material were shipped resulting from this activity.

During Phase 2, clean overburden was separated from the contaminated material, surveyed, and disposed off site with other common soil being removed as part of the general construction requirements. Material with levels of contamination greater than 7.1 pCi/g was either loaded directly into intermodal containers, or set to drain for awhile and then loaded. The intermodal containers were then transported by truck to the railyard at Blue Island, IL, where they were placed on railcars for delivery and ultimate disposal at Envirocare. A total of 221 containers carrying 4,809 tons of material with radioactivity exceeding the cleanup criteria were shipped during Phase 2.

A brief description of the Phase 2 activities is presented in this report. A detailed presentation of the Phase 2 activities can be found in STS's Phase 2 Final Report.

2.2.1 Quantities and Types of Materials Removed

During Phase 2, 4,809 tons of material with radioactivity exceeding the cleanup criterion were excavated, loaded into intermodal containers, and shipped by truck and rail to Envirocare. The material was comprised of soil and urban fill consisting of brick, cinders, wood, metal, and debris. Soil from Lake Lindsay was predominately sand.

Clean overlying materials and site fill from areas not excavated in Phase 1 were surveyed by the STS health physics technicians and released as non-radioactive material. This included urban fill, soil, concrete chunks, and petroleum-contaminated soil. The petroleum-contaminated soil was turned over to River East for disposal as special waste. Petroleum contaminated soil disposal was not a condition of the UAO and therefore the quantity disposed is unknown and the manifests are not available.

2.2.2 Destinations of Disposed Materials

Material with radioactivity exceeding the cleanup criterion was sent via train to Envirocare. Copies of Envirocare's Forms 540 and 541 reflecting shipment to and receipt of this Phase 2 material at the U.S. NRC licensed disposal site are included in Attachment D.

2.2.3 Verification Sampling

After the material above the cleanup criterion had been excavated in an area, STS's health physics technicians performed a verification survey in accordance with Kerr-McGee SOP-223.

If the samples met the release criteria defined in the UAO, then STS sent a request to release an area (form 223-1: *Notification of Successful Verification Survey*) to the U.S. EPA. After the U.S.EPA released an area it was thereby approved to proceed with additional excavation below the verified grades.

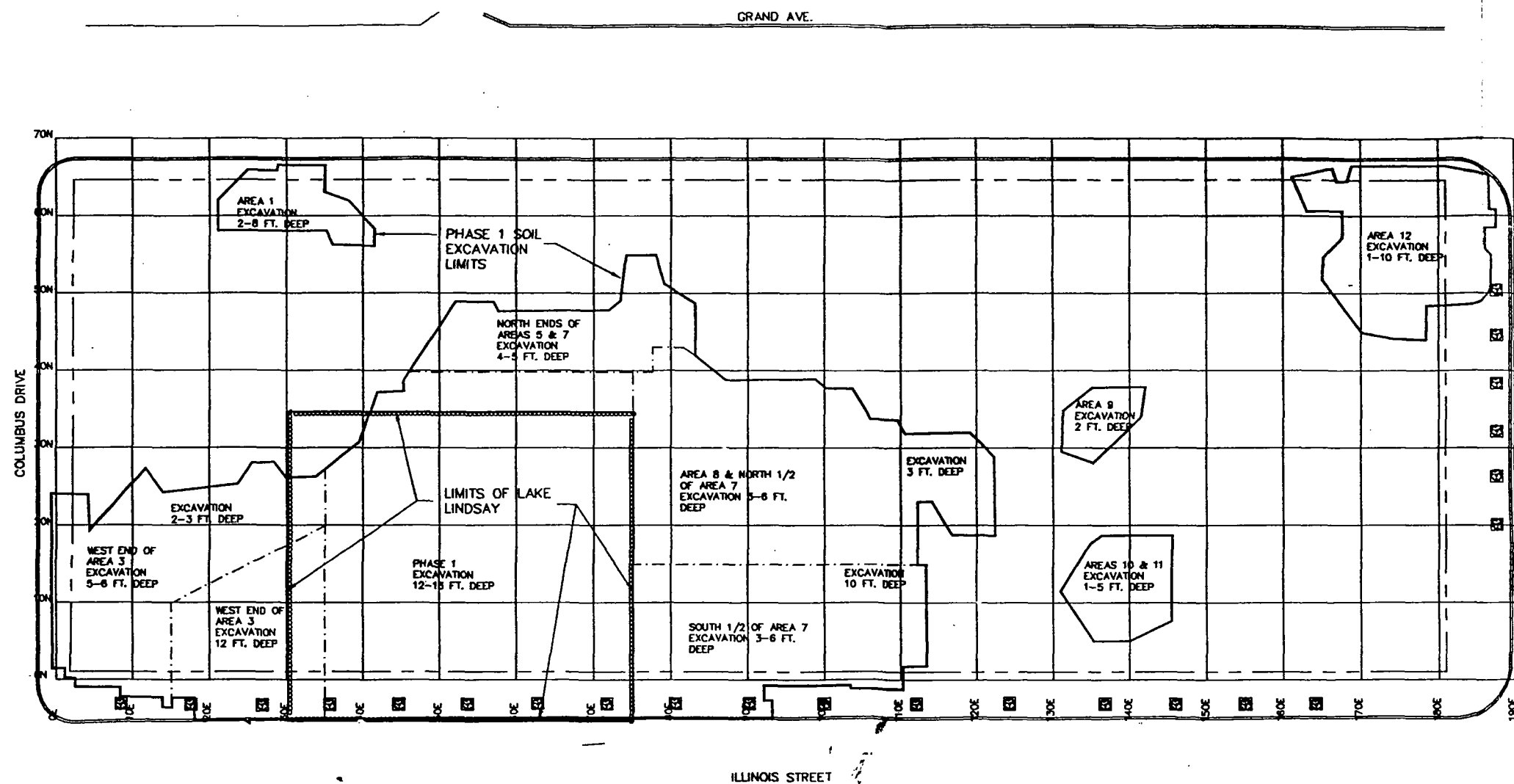
STS's Phase 2 Final Report includes the U.S. EPA's authorizations that the UAO verification criteria were met for each of the areas where material above the cleanup criterion was excavated in Phase 2.

2.2.4 Overburden Surveying

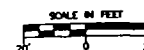
Excavated overburden was set off to the side and surveyed by STS's health physics technicians. Any areas above the cleanup criterion were removed and then the material was resurveyed. If the material surveyed radiologically clean, the material was shipped offsite by River East's earthmoving contractor.

2.2.5 Air Monitoring

During Phase 2, four air monitoring stations were established by STS in the center of all four perimeter boundaries. Monthly summaries of the perimeter air monitoring sampling results are included in STS's Phase 2 Final Report.



- LEGEND:**
- PHASE 1 SOIL EXCAVATION LIMITS
 - PHASE 1 VERIFICATION AREAS
 - LIMITS OF LAKE LINDSAY (Phase 2)
 - 1-5 APPROXIMATE DEPTH OF PHASE 1 EXCAVATION
 - PROPERTY LIMITS



LIMITS OF PHASE 1 REMOVAL ACTION
LINDSAY LIGHT II
300 EAST ILLINOIS STREET
CHICAGO, ILLINOIS

DATE	12-10-99	BY	DLJ	DATE	12-10-99	BY	DLJ
REVISION		NO.		REVISION		NO.	
1		1		2		2	
3		3		4		4	
5		5		6		6	
7		7		8		8	
9		9		10		10	
11		11		12		12	
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97		97		98		98	
99		99		100		100	



PROJECT NUMBER
PROJECT FILE
SCALE
AS SHOWN
FIGURE NUMBER
2-1

3.0 DIFFICULTIES ENCOUNTERED AND RESOLUTIONS

This section of the Final Report provides a list of items that affected the response action, and the way the difficulties were resolved.

3.1 Phase 1

The primary difficulties encountered during Phase 1 were related to weather, intergovernmental items, and contamination extending beyond areas identified in the delineation drilling.

3.1.1 Cold Weather Work

Excavation for Phase 1 began in October. This is typically a month when excavation projects are winding down, not starting up. In an effort to get Chicago Dock's parking lot back open for business, Kerr-McGee Chemical had their crews work through the winter of 1996/1997. Winter work posed difficulties in performing the work safely while maintaining production rates.

Winter safety concerns included slipping on muddy or icy surfaces, equipment and vehicle traction, truck safety, reduced daylight hours, worker exposure and frostbite. Production rates plummeted for a multitude of reasons including: equipment had to be warmed up before being used, material was frozen and had to be broken prior to being excavated or sampled, workers had to move more slowly to minimize slipping, and workers had to come into warming trailers on regular intervals.

The difficulty of working safely in cold weather was resolved by reducing the expected production rates for the crews, and by providing extra safety training for performing the work. This was a significant cost factor that was borne by Kerr-McGee Chemical.

Another effect of the freezing conditions was that the back doors on three of the containers opened in the railyard as the trains were being assembled. The standard train building procedure is to load the containers onto flat cars. The flat cars are then allowed to roll down an incline until they couple with a string of cars. This procedure is commonly known as humping.

During a very cold spell, the soil inside each of three separate containers froze into a solid mass and acted as a 22-ton battering ram against the back door during the humping process. Kerr-McGee Chemical provided an emergency response and contained the spilled material until the shipper could repair the containers.

This was resolved by instructing the railroad not to hump the cars while assembling trains, and by prominently posting "Do Not Hump" on each bill of lading. The response is explained in detail on CAR-97-001, which is included in Attachment J.

3.1.2 Keeping the Scale Operational

Working through winter also posed a significant difficulty in keeping the container scale operational. The scale used electronic load cells to determine the weight of the loaded container. The load cells tended to short out whenever it was misty or it rained. The cable connections became very brittle in extreme cold and repeatedly broke and needed replacement.

The difficulty of keeping the scale operational through the cold and wet weather was resolved by ordering a second scale to be kept on hand just to cannibalize it for parts. Monthly rental of a second scale, replacement parts, and labor were a significant cost increase that was borne by Kerr-McGee Chemical.

During Phase 2, the scale was eliminated and the average of all the containers loaded in Phase 1 was used as the weight for each container shipped in Phase 2.

3.1.3 Dust Control

Kerr-McGee Chemical implemented dust control policies to comply with the Dust Control Plan (Document 101 of the *S & P Documents*). Implementing a zero-dust policy was very difficult and labor intensive. This also posed a safety problem when the temperature was below freezing. Watering the excavation caused the material to freeze, caused slippery conditions and driving surfaces, and was a safety hazard for the laborer handling the water and dragging the hoses.

This difficulty was resolved by always having water in place during excavation and restoration activities. In the winter, pumps and hoses had to be drained each night to prevent freezing. Non-excavated portions of the site were also kept watered down. An equipment operator was hired to drive a pavement sweeper to pick up clean dirt that had settled on non-excavated portions of the site. Labor and equipment costs to enforce a site wide zero-dust policy were a significant cost that was borne by Kerr-McGee Chemical.

3.1.4 City Noise Ordinance

The Municipal Code of the City of Chicago stated that fuel operated equipment could only be operated between 8:00 a.m. and 9:00 p.m. This caused a difficulty in winter because it starts to get dark around 4:30 p.m.

City ordinances do not apply to CERCLA projects, so it would have been more productive for the project if crews could have started earlier to take better advantage of daylight hours.

This difficulty was resolved by reducing production and complying with the City Code so that excavation or restoration activities were not started until 8:00 a.m.

If City Ordinances do not apply, why followed?

3.1.5 Materials Greater than Cleanup Criterion beyond limits of Delineation Drilling

The delineation-drilling program performed at the site was quite extensive. However it was limited by the geoprobe drilling equipment used. Unexpected basement floors with associated drilling refusals were encountered throughout the southern half of the property. At the time of the delineation drilling, indications were that basements had been filled in with contaminated fill. There was no evidence that contamination was present below the basement slabs.

During the Phase 1 excavation, the soil and debris overlying the concrete basement slabs was removed. Surveys of these surfaces indicated that the contamination extended below the old basement slabs. The slabs were broken up and removed and a significant quantity of soil was excavated from below the basement slabs. The material below the basement slabs consisted of native beach sands that had levels of radioactivity above the cleanup criterion. Some of this material extended below the water table, and would be left unexcavated at the end of Phase 1, to be removed during the subsequent Phase 2 excavation.

This difficulty was resolved by excavating and shipping the additional material. The additional quantity extended the project schedule, and required rental of several hundred extra containers to ship the material. More complete drilling information may have allowed for better planning and allowed Kerr-McGee Chemical to get a reduced quantity rate for the container rentals.

3.1.6 Materials Greater than Cleanup Criterion under Illinois Street and Columbus Drive

During the removal action, testing along Illinois Street and Columbus Drive revealed very minor deposits of material exceeding the cleanup criterion which could not be readily excavated. Excavation would have required significantly disruptive lane closures and utility relocations on highly traveled thoroughfares. The U.S. EPA decided that this material could be left in place with institutional controls. The details of the institutional controls are discussed in the 9-22-99 Action Memorandum Amendment.

3.2 Phase 2

The primary difficulties encountered during Phase 2 were related to coordination with the construction of the River East Center.

3.2.1 Delays to Project Start

In a planning meeting held on September 23, 1998, Kerr-McGee was notified by River East that the Phase 2 remediation would begin in October of 1998. Kerr-McGee began immediate preparations for the rapidly approaching start. Intermodal containers and transport chassises were rented. Kerr-McGee labor was dedicated to the upcoming work. Supplies were purchased and made ready for use.

There were numerous delays to the actual start of Phase 2. The actual work did not begin until May 16, 1999, a delay of seven months. This difficulty was resolved by Kerr-McGee's commitment to keeping a crew on standby throughout the winter of 1998/ spring 1999. This crew would normally have been seasonally laid off at that time of the year.

The difficulty was resolved by Kerr-McGee bearing additional costs for labor and equipment rental.

3.2.2 Coordination with Morse-Diesel/STS

Phase 2 also presented difficulties due to the complexities of coordinating the environmental remediation into a major unrelated effort, the construction of the River East Center. STS was directing the Phase 2 remediation, while Morse Diesel was directing the construction of the River East Center. STS and Morse Diesel each had distinct contracts with River East, therefore there was no direct line of command between Morse-Diesel and STS.

This difficulty manifested itself in a general lack of communication between these parties involved in the Phase 2 work. River East noted this, and they directed Morse-Diesel to begin having weekly planning meetings. The first such meeting was held on September 7, 1999, four months after the Phase 2 work began.

As a result of the early communication difficulties between the involved parties and the dynamic nature of the high-rise construction process, the Kerr-McGee crews could never be certain when excavation of radioactive material above the cleanup criterion was going to take place. To resolve this difficulty, Kerr-McGee kept a skeleton crew on site whenever there was even a possibility of encountering material above the cleanup criterion during the period of June 1, 1999 to October 22, 1999. Similar to other

resolved difficulties, this issue was resolved by Kerr-McGee bearing additional costs for labor.

3.2.3 Drying Material Prior to Shipping

Between Phases 1 and 2, the disposal facility revised their acceptance policy regarding the amount of water that was allowed to be in the void spaces of the shipped material. During Phase 1, dust control was a primary concern, and so water was added to each load to minimize any possibility of dust creation. This material would pass the paint filter test, but did have moisture in the pore spaces of the soil matrix.

During Phase 2, the disposal facility stated that simply passing the paint filter test was not adequate, and in addition there could be no excess water on the bottom of the container. As the coarse grained soil sat in the container on its cross-country trip, the uniformly moist sand that passed the paint filter test, would drain by gravity within the container. This resulted in a very dry soil at the top of the container, and wet soil exceeding its soil moisture capacity on the bottom of the container. When these containers were opened, a small quantity of free moisture could be observed on the bottom of the container.

This difficulty was resolved by drying the soil before it was loaded in the containers. The wet soil was predominantly coarse-grained sand from below the former water table in the Lake Lindsay area. If the soil appeared damp, it was set in piles to drain prior to loading. Being a free draining material, a significant portion of the water in the matrix would drain within a short time after being placed in a pile. The material was then handled again and loaded into the container. As each bucketful was placed into the container, a water absorbing polymer was thrown in with the soil. This polymer had the ability to absorb 100 times its weight in free water.

By letting the soil drain and adding the polymer, the soil arrived at the disposal facility with no free moisture at the bottoms of the containers. The drying polymer cost approximately \$200 per 50-pound bag, and approximately two bags were used per container.

3.2.4 Materials Greater than Cleanup Criterion under Grand Avenue

During the Phase 2 removal action, testing along Grand Avenue revealed very minor deposits of material above the cleanup criterion which could not be readily excavated. Excavation would have required significantly disruptive lane closures and utility relocations on Grand Avenue. The U.S. EPA decided that this material could be left in place with institutional controls. The details of the institutional controls are discussed in the 9-22-99 Action Memorandum Amendment.

4.0 RECOMMENDATIONS

This section of the Final Report provides a list of items that had they been implemented, would have resulted in an improvement of the response action, in terms of safety, quality and or cost.

4.1 Phase 1

The primary recommendations arising from Phase 1 are related to a UAO that is more stringent than published government standards, the work season, dust control, and the preliminary investigation.

4.1.1 Averaging

Paragraph V.3.d. of the UAO states:

"Remove contamination until the cleanup criterion of 5 picoCuries per gram total radium ... over background is achieved. This cleanup criterion will be met in each 15 centimeter layer below the surface. Averaging over areas up to 100 square meters will be allowed, but only after reasonable efforts have been made to achieve levels As Low As Reasonably Achievable ("ALARA"). It is not U.S. EPA's intent to leave any elevated areas of contamination if at all possible."

Title 40 of the Code of Federal Regulations (CFR), Part 192, Subpart B, (Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials, Sec. 192.12 - Standards) defines the cleanup rate as 5 pCi/g averaged over 100 square meters. 40CFR192 makes no mention of further ALARA actions to eliminate elevated areas of contamination.

Compliance with the criteria as set forth in Paragraph V.3.d of the UAO resulted in the excavation and shipment of substantial quantities of additional material.

If Kerr-McGee had been allowed to follow the requirements set forth in 40 CFR 192 Subpart B, substantially less material would have been excavated and shipped to the disposal facility.

Also, Kerr-McGee incorporates herein by reference "Comments on the Unilateral Administrative Order," dated July 9, 1996 as submitted by counsel for The Chicago Dock and Canal Trust and counsel for Kerr-McGee Chemical Corporation, docket No. V-W-96-C-353.

4.1.2 Winter Work

Phase 1 of the project proceeded through the winter of 1996/1997. Kerr-McGee Chemical was very fortunate to complete the work without a

Keep at
Delete?
4.1.1
What's the
point?

Shouldn't we
"Comments on the UAO",
7/9/96?

If less
stringent, how
would future
development
be affected
as a tower, hotel?

serious accident. In addition to relatively high safety risk, working through the winter was a very inefficient and an unnecessarily expensive use of labor and equipment.

In hindsight, the start of work should have been delayed to March of 1997. With good daylight and longer work hours, the improved production would most likely have resulted in a similar completion date.

4.1.3 Dust Control

The purpose of the dust control activities at the Site was to prevent worker exposure to or off-site release of fugitive dust containing radioactive particles. In order to comply with this requirement, Kerr-McGee implemented a zero dust policy on the Site. This included renting a special pavement sweeper to keep the asphalt surface clean, and using dust control during restoration activities.

The response action would have performed at a lower cost with an equal amount of protection to workers and the public if dust control had been limited to control of fugitive dust created during excavation as opposed to water being added whenever excavation was occurring. If excavation activities did not generate dust then water should not have been added to the soil during the loading process. Approximately 5% of the total tonnage shipped can be attributed solely to water added for unnecessary dust control.

There was also a significant labor and equipment cost associated with performing dust control on areas outside of the excavation area, and during site backfilling operations. These activities may have generated dust, however the dust was not radioactive and did not pose any increased risk to the workers or the public. The site-wide zero dust policy including restoration activities was unnecessarily expensive and restrictive.

4.1.4 Preliminary Investigation

The delineation-drilling program was limited by underground obstructions. At the time of the investigations, there was no historical evidence of basement slabs. The obstructions were thought to be concrete or steel debris left behind from the demolition of the historical site buildings.

During the Phase 1 remediation, these obstructions were discovered to be an extensive area of concrete slabs from old basements. Quantities of radioactive material above the cleanup criterion were found and excavated from elevations below these basement slabs.

The response action would have been performed more efficiently had the extent of contamination been known prior to commencing excavation. It

*How much water
was originally
amalgamated?
—
Did EPA state
that work had
to begin in winter?*

would have been possible to salvage much greater quantities of clean overburden if accurate cross-sections had been available prior to digging. Chasing a deep layer of material above the cleanup criterion without first stripping clean overburden, was inefficient because clean soil mixed in with the contaminated material and became impossible to segregate.

4.2 Phase 2

- 4.2.1 Recommendations arising from Phase 2 are discussed in STS's Phase 2 Final Report.

ATTACHMENT A

PHASE 1 WORK ORDERS

**FOR PROPERTY EXCAVATION AND RESTORATION FOR LINDSAY LIGHT II
SITE AT 316 E. ILLINOIS ST.**

PROPERTY OWNED BY THE CHICAGO DOCK & CANAL TRUST

PROPERTY OWNED BY THE CITY OF CHICAGO

**DRAWING LL II – WO, WORK ORDER PLAN FOR REMOVAL/RESTORATION,
Prepared by STS Consultants, October 1996.**

Photograph?

ATTACHMENT B

**CONTRACTS, SUBCONTRACTS AND MISCELLANEOUS
PURCHASE ORDERS**

In Accompanying Box

ATTACHMENT C

**MISCELLANEOUS INVOICES ASSOCIATED WITH THE CONTRACTS,
SUBCONTRACTS AND PURCHASE ORDERS**

In Accompanying Box

ATTACHMENT D

**ENVIROCARE OF UTAH INC.
UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFESTS**

In Accompanying Box

Phase 1 – 1996/1997

9001-9999

8500-8571

Phase 2 – 1999

8600-8820

ATTACHMENT E

**PHASE 1 VERIFICATION RELEASES FROM U.S. EPA,
VERIFICATION SAMPLING RESULTS,
AND GRID MAPS**

ATTACHMENT F

PHASE 1 OVERBURDEN SAMPLING DATA

ATTACHMENT G

PHASE 1 AIR MONITORING DATA

ATTACHMENT H

PHASE 1 PERMITS

ATTACHMENT I

PHASE 1 FILL MATERIAL RADIOLOGICAL & CHEMICAL ANALYSES

ATTACHMENT J

BACKFILL COMPACTION & GEOTECHNICAL DATA

ATTACHMENT K

PHASE 1 CONCRETE INSPECTION REPORTS

ATTACHMENT L

PHASE 1 INTERNAL QA DOCUMENTATION

ATTACHMENT M

PARKING LOT RESTORATION DRAWINGS

**LINDSAY LIGHT II SITE RESTORATION, 316 E. ILLINOIS STREET, CHICAGO, IL
DRAINAGE MODIFICATIONS AND PARKING LOT RESTORATION**

Prepared by Fluor Daniel GTI, May 1997